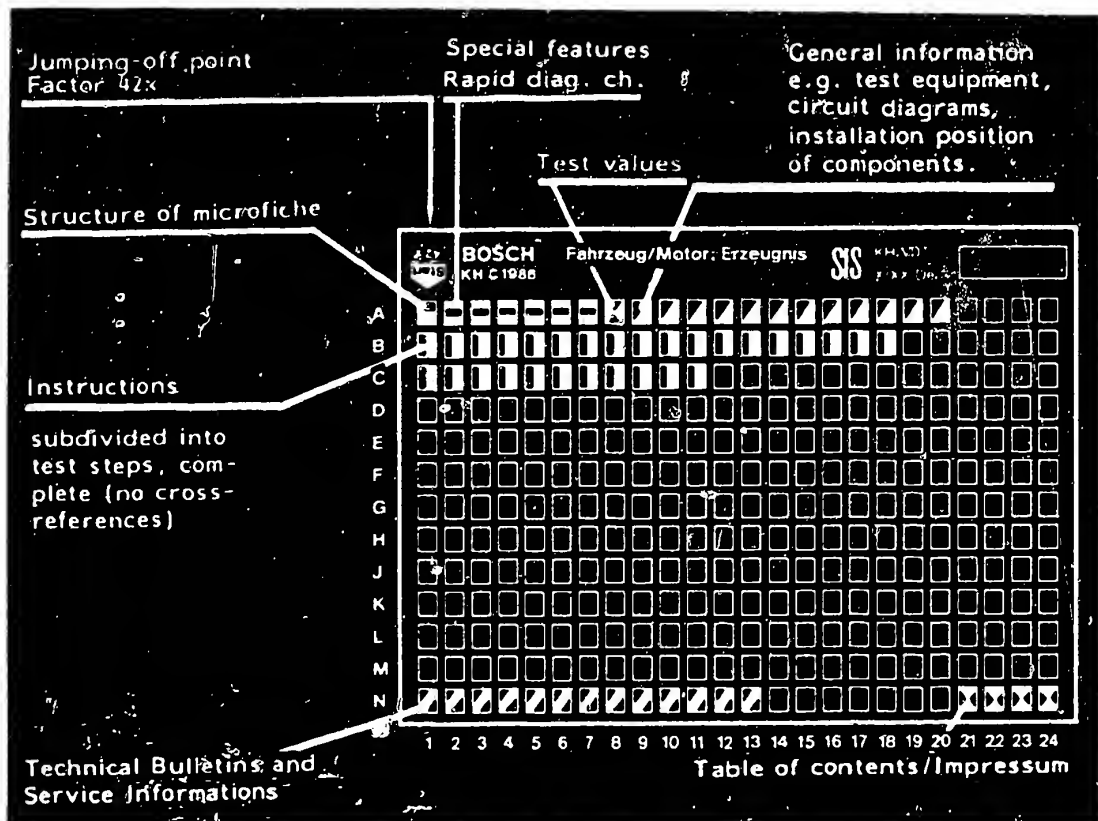


## Structure of microfiche

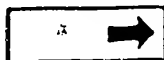


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

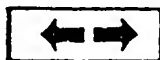
<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



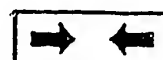
Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

**C6**

**A1**

Trouble-shooting program



## 1. Special features

This microcard deals with the Seat vehicle types with breakerless transistorized ignition system (TCI-h)

Ibiza as of 9.84

Ronda P as of 4.84

Malaga as of 9.85

with Porsche engine.

Trigger box 1 227 022 008 (with current limitation)

Ignition coil 1 227 020 015

## 2. Rapid diagnosis chart

The rapid diagnosis chart starting at coordinate A4 makes it possible for the experienced expert to quickly check the ignition system using the necessary test equipment and aids.

The rapid diagnosis chart contains the test-step sequence, possible cause of fault, test instructions, test specifications and coordinate information.

### Using the rapid diagnosis chart

The rapid diagnosis chart starting at coordinate A4 is to be used when there is a primary signal or ignition spark.

The rapid diagnosis chart starting at coordinate A6 is to be used where there is no primary signal or ignition spark.



If detailed information and instructions on trouble-shooting are necessary, always proceed according to the trouble-shooting program starting on coordinate B7.

Test requirement

Battery fully charged, fuel system O.K., engine mechanically O.K. (e.g. compression, valve clearance etc.).

Ambient temperature, that is, temperature of the ignition system 0° up to 100°C (temperature greatly affects readings).

Before disconnecting plug connections, the ignition must be switched off.



## 2. Rapid diagnosis chart Primary signal or ignition spark available

Test step	Possible cause of trouble	Test instructions	Test specifications	Coordinates
1	High-voltage end	Visual examination e.g. of ignition harness, distributor cap etc. continuity test, ignition oscillogram	---	--
2	Ignition coil	Visual examination, plugs present, sealing compound escaped? Electrical test Primary term. 1 and term. 15 Secondary term. 1 and term. 4	0.6 ... 1.0 $\Omega$ 6.4 ... 11.1 k $\Omega$	B 10
3*	Contact resistances	Check for contact resistances in leads for voltage supply of trigger box.	max. 0.3 $\Omega$	B 12
4	Ignition-timing adjustment	Adjust ignition. If present, short circuit digital-idle-stabilizer plug.	Autodata test specifications	--
5	Voltage supply, trigger box	Engine idle. Voltage at trigger-box plug term. 4 (+) and term. 2 (-).	12 ... 14 V max. 1 V below $U_B$	B 14
6	Voltage supply, ignition coil	Engine idle. Voltage at ignition coil term. 15 to battery, negative terminal.	min. 10 V	B 14
7	Peak-coil-current cut-off	Ignition ON. Voltage at ignition coil term. 15 and term. 1. Trigger wheel completely in air gap.	approx. 1 s approx. 5 V afterwards 0 V	B 16
8	Primary voltage	Engine idle. Measure primary voltage at ignition coil term. 1 and term. 15.	290 ... 350 V	B 11

\* Only carry out when engine not running.

**A4**

Rapid diagnosis chart

Seat



**A5**

Rapid diagnosis chart

Seat



## 2. Rapid diagnosis chart    no primary signal or no ignition spark available

Test step	Possible cause of trouble	Test instructions	Test specifications	Coordinates
1	Voltage supply, trigger box	Ignition ON. Voltage at trigger-box plug term. 4 (+) and term. 2 (-).	$U_B$	C 1
2	Voltage supply	Ignition ON. Voltage at trigger-box plug term. 1 (+) and term. 2 (-).	$U_B$	C 1
3	Magnetic pulse generator, voltage and control leads	Check for continuity in leads from trigger box to ignition distributor. Trigger-box plug term. 3 and ignition-distributor plug term. 3 Trigger-box plug term. 5 and ignition-distributor plug term. 5 Trigger-box plug term. 6 and ignition-distributor plug term. 6	approx. $0\ \Omega$	C 3
	Magnetic pulse generator, voltage supply	Ignition On. Voltage at trigger-box plug term. 5 (+) and term. 3 (-).	$\geq 10\ V$	C 5
	Magnetic pulse generator, operation	Start engine. Signal to term. 6 (o) of ignition-distributor plug.	Rectangular pulses	C 7
4	Ignition coil	Visual examination, plugs present, sealing compound escaped? Electrical test    Primary    term. 1 and term. 15 Secondary term. 1 and term. 4	$0.6 \dots 1.0\ \Omega$ $6.4 \dots 11.1\ k\Omega$	C 9

### 3. Test specifications

Ignition coil                      primary 0.6 ... 1.0  $\Omega$   
   secondary 6.4 ... 11.1 k $\Omega$

**B 10**

Voltage supply                      12 ... 14 V  
Trigger box                      max. 1 V below battery  
   voltage  
Ignition coil                      > 10 V

**B 14**

Peak-coil-current cut-off  
approx. 1 s:                      approx. 5 V  
afterwards                      0 V

**B 16**

Primary voltage with engine  
at idle (connect pulse-shaping  
circuit in series)                      290 ... 350 V

Voltage supply  
Magnetic pulse generator with ignition on > 10 V

**C 5**

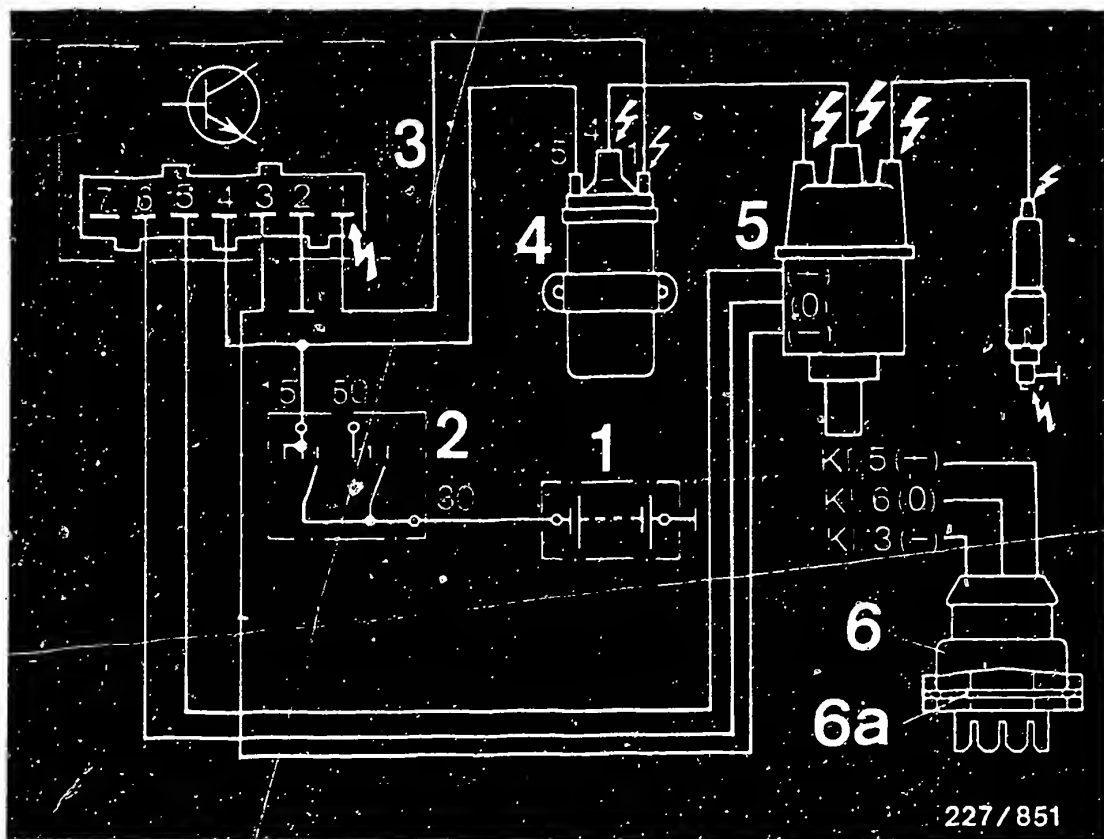
See in Autodata test specifications for settings for  
ignition, idle speed, exhaust gas, valve clearance etc.

**A8**

Test specifications

Seat

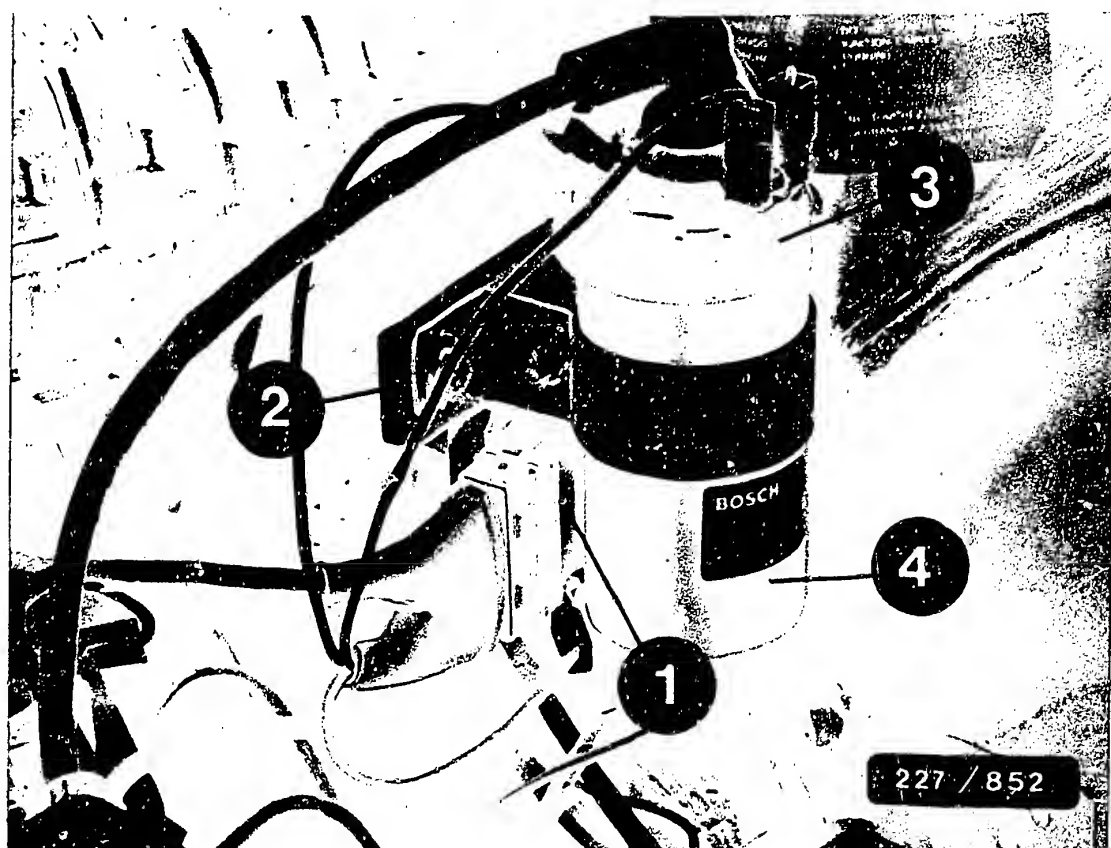




#### 4. Electrical terminal diagram

- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition coil
- 5 = Ignition distributor
- 6 = Ignition-distributor connector
- 6 a = Wire-strap fuse

High-voltage arrows = dangerous voltages  
(400 V - 25 kV)



- 1 = TCI-h trigger box
- 2 = Heat sink
- 3 = Protective cap
- 4 = Ignition coil

#### 4. Installation position of components

Ignition coil and trigger box are mounted on the same heat sink and positioned in the engine compartment (near to battery).





## 6. Necessary test equipment, aids

Motortester e.g.	MOT 201	0 684 000 201
Spark gap e.g. ignition-coil and condensor tester or single spark gap	EFAW 106A EF 1177/7	0 681 100 001 1 684 531 000
Sleeve-type suppressor		0 356 500 001
Ohmmeter or e.g.	ETE 014.00 Pontavi Wh2	0 684 101 400 commercially available
Voltmeter	ETE 014.00	0 684 101 400
Pulse-shaping circuit (required for measurement of primary voltage with MOT 201, 202, 400)		1 684 463 154
Test prods, red black		1 684 485 035 1 684 485 034
Test leads (for expert connection of test devices to connectors)	KDZS 0004 KDZS 0005	
Heat transfer compound		5 942 860 003
Vacuum pump e.g. from Korinth Ludwig-Kloos-Str. 21 D-6450 Hanau 7 - Steinheim	Mityvac	commercially available



## 7. Danger of accidents in electronic ignition systems

Increased demands placed on ignition systems by modern engines, as well as the desire for reduced maintenance, caused electronic ignition systems to be introduced as standard equipment some time ago.

As a rule, the power supplied by nearly all electronic ignition systems exceeds that of conventional systems, and further increases are expected. Thus electronic ignition systems are within a power range where contact with live parts or terminals can be extremely hazardous (on both the primary and secondary sides).

We therefore recommend that any work or tests performed on the ignition system be in accordance with VDE Regulations (Association of German Electrical Engineers), particularly VDE 0104 dated July, 1967, as well as all pertinent national regulations.

The ignition must always be switched off when work is performed on the ignition system (switch off ignition and/or power supply):

This work includes:

- attaching engine testers (timing light, dwell-tach tester, ignition oscilloscope, etc.)
- replacing ignition system parts (spark plug, ignition coil, ignition distributor, ignition cable, etc.)



If, when checking the ignition system or when performing adjustments of the engine (e.g. LH-Jetronic), it becomes necessary to switch on the ignition (ignition/voltage source), the above-mentioned dangerous voltages occur over the entire system.

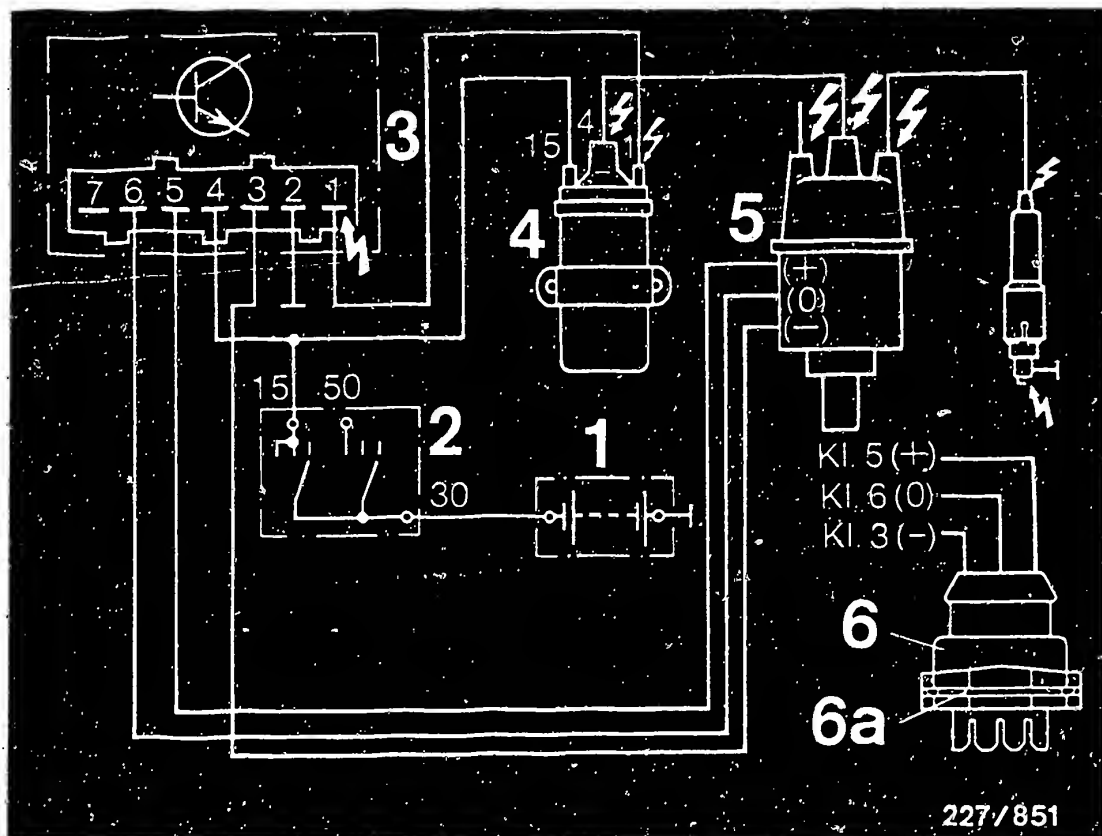
Hazards therefore exist not only within the individual subassemblies of the ignition system (e.g. ignition distributor, ignition coil, control unit, ignition harness), but also at the wiring harness (e.g. tachometer connector, diagnostic connector), plug connection cables and test equipment.

**A13**

Danger of accident

Seat





High-voltage arrows = dangerous voltages  
(400 V - 25 kV)

- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition coil
- 5 = Ignition distributor
- 6 = Ignition-distributor connector
- 6a = Wire-strap fuse

Using the terminal diagram of an electronic ignition system as an example, the dangerous locations are identified by high-voltage arrows.



8. Incorrect indication of engine speed, dwell angle and ignition point

In the case of ignition system with trigger box 1 227 022 008, there may be incorrect indication of engine speed, dwell angle and ignition point. For more detailed information, see coordinates N8 - N13.



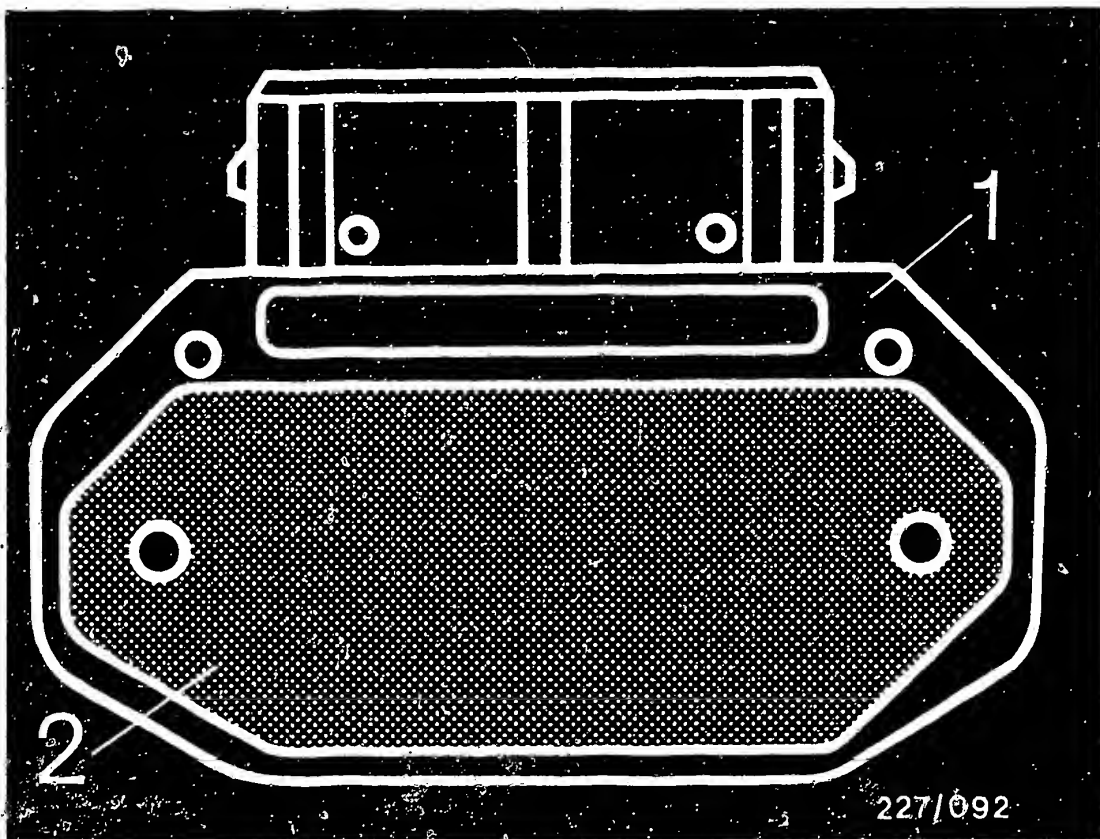
## 9. Important vehicle information

- Test resistance only with ignition switched off and/or battery disconnected (ohmmeter defective).
- When testing the compression; disconnect trigger-box plug or connect ignition coil term. 4 firmly to ground using auxiliary cable (dangerous high voltage, insulation damage at ignition coil, ignition distributor, ignition harness)

### Note:

Auxiliary cable must be interference-suppressed by at least 2 k $\Omega$ , e.g. sleeve-type suppressor (5k $\Omega$ )  
0 356 500 001.





1 = Control unit

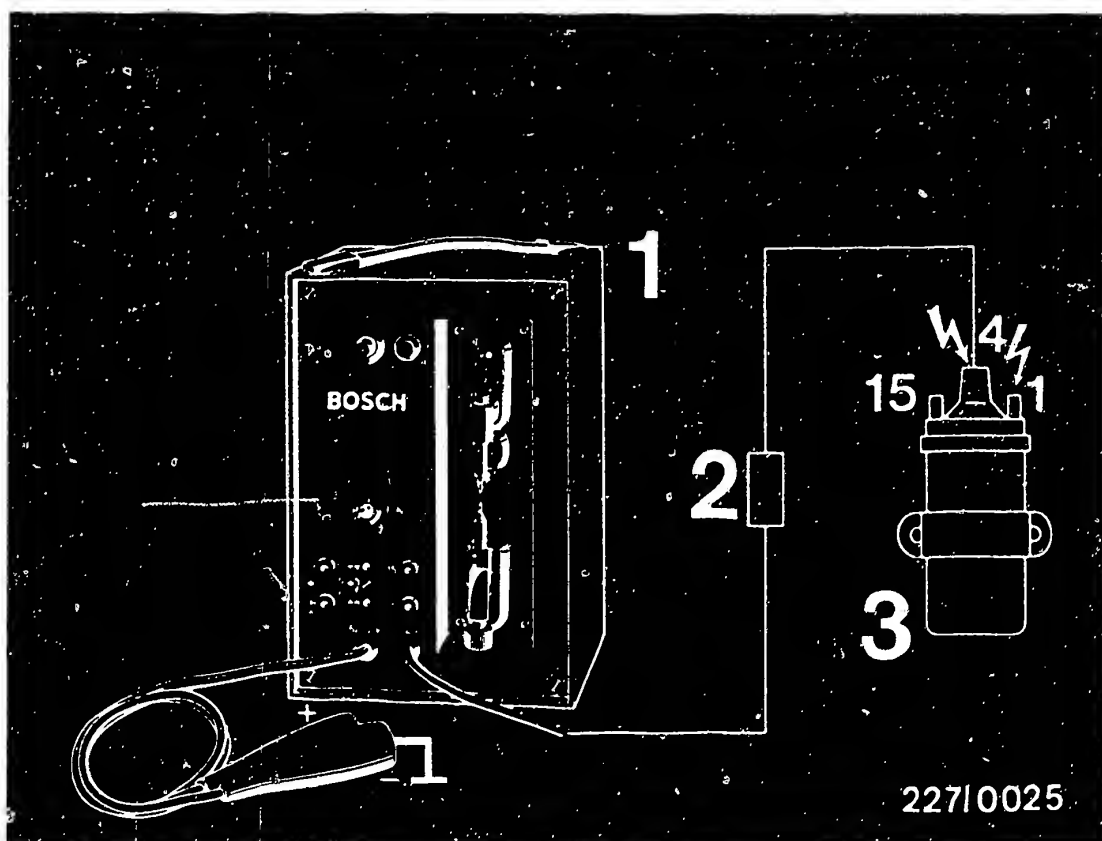
2 = Baseplate

- Coat baseplate with thermal conduction paste before mounting control unit.

Use only suitable object (screwdriver, match, etc.) to apply paste.

Keep thermal conduction paste off painted parts.





1 = Spark discharge tester

3 = Ignition coil

2 = 5 kΩ sleeve-type suppressor

Danger arrows: 400 V ... 25 kV = dangerous voltages  
(400 V - 25 kV)

- To prevent damage to the control unit when using a spark discharge tester, a suppression resistor of at least 2 kΩ must be connected between the spark discharge tester and ignition coil terminal 4 (e.g. 5 kΩ sleeve-type suppressor 0 356 500 001) to prevent damage to the control unit.





- To prevent damage to the control unit, a suppression resistance of at least 2 k $\Omega$  must be connected to the secondary side of the ignition system. The original distributor rotor must be installed with a 1 k $\Omega$  suppression resistor (also do not use a 5 k $\Omega$  distributor rotor for radio interference suppression).
- Do not attach any external voltage source such as an ohmmeter to the magnetic pulse generator.

Use caution when switching meter ranges.

- Holding springs of ignition-distributor cap must not fall into the generator system when the engine turns over and with the dust-protection cover removed.
- Flashover or punchthrough at ignition distributor cap (poor insulation) may destroy the magnetic pulse generator and the control unit.
- Do not disconnect battery terminals with engine running.
- If the battery is incorrectly connected, the magnetic pulse generator, trigger box and ignition coil are destroyed.
- Do not assist starting at more than 16 volts or with a fast charger.



- Do not replace specified ignition coil (see part No.) with a different type of ignition coil.
- Do not connect a suppression capacitor to ignition coil terminal 1.
- Do not connect ignition coil terminal 1 to ground as an anti-theft measure (when ignition is switched "on" ignition coil will be destroyed).
- Do not connect a positive battery terminal or test lamp to ignition coil terminal 1 (control unit will be destroyed).
- Do not remove the high voltage ignition cable between ignition coil terminal 4 and ignition distributor terminal 4 with the engine running.
- Flashover from ignition coil terminal 4 to ignition coil terminals 1 and 15 must be prevented. The magnetic pulse generator and control unit could be destroyed.



## 10. Trouble-shooting

### 10.1 Using the trouble-shooting chart

The trouble-shooting chart starting at coordinate B3 contains customer complaints (symptoms of trouble), causes of trouble, test instructions and details of coordinates.

The possible cause of trouble must be chosen from the trouble-shooting chart in accordance with the customer complaint (symptom of trouble).

If the cause of trouble is uncertain, testing must be initiated using the detailed and complete trouble-shooting program starting at coordinate B7.

If the cause of trouble is clearly detected following the trouble-shooting chart, directed trouble-shooting is possible using the coordinate information without having to go through the complete trouble-shooting program for each failure. If there is no coordinate information given, trouble-shooting must be carried out in accordance with the "Test instructions" column.

**B1**

Trouble-shooting

Seat



## 10.2 Using the trouble-shooting program

The trouble-shooting program is divided into 3 columns of boxes.

The left-hand column contains test instructions and test specifications.

The center column contains repair instructions.

The right-hand column contains the illustration/terminal diagrams to the text and the key to the illustrations.

If the questions asked in the left-hand column can be answered with a definite "yes", continue to the subsequent test beneath.

If the answer is "no", branch off to the center column and carry out the tests specified there.

## 10.3 Test requirement

Battery fully charged, fuel system O.K. engine mechanically O.K. (e.g. compression, valve clearance etc.). Ambient temperature or temperature of ignition system 0° up to 100°C (temperature greatly influences readings).



Customer complaint (symptom of trouble)

- ```

|1. Starting motor operates, but engine fails to start
|
|2. Rough idling
|
|   |3. Poor throttle response
|   |
|   |   |4. Engine lacks power
|   |   |
|   |   |   |5. Misfiring
|   |   |   |
|   |   |   |   |6. Fuel consumption too high
|   |   |   |   |
|   |   |   |   |   |7. Engine pings when accelerating
|   |   |   |   |   |
|   |   |   |   |   |   |8. Backfiring
|   |   |   |   |   |   |
|   |   |   |   |   |   |   |9. Engine becomes too hot

```

|   |   |   |   |   |   |   |   |   | <u>Cause of trouble</u>                     | <u>Test instructions</u>                                                                                                                      | <u>Coordinates</u> |
|---|---|---|---|---|---|---|---|---|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| • | • | • | • | • | • |   | • |   | Spark plugs defective                       | Assess using ignition oscillogram or remove spark plug and make visual examination.                                                           | ---                |
| • | • | • | • | • | • | • | • | • | Ignition point not correct                  | See Autodata test specifications                                                                                                              | ---                |
| • | • | • | • | • |   |   |   |   | Shunt on secondary side                     | Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram or test for continuity using ohmmeter. | ---                |
| • | • | • | • | • |   |   |   |   | Short circuit on secondary side             | Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram or test for continuity using ohmmeter. | ---                |
|   |   | • | • | • | • |   |   |   | Interference-suppression resistors not O.K. | Assess using ignition oscillogram or measure resistance.                                                                                      | ---                |
|   | • | • | • |   | • | • | • | • | Centrifugal advance incorrect               | See Autodata test specifications.                                                                                                             | ---                |
|   |   | • | • |   | • | • |   | • | Vacuum advance incorrect                    | See Autodata test specifications.                                                                                                             | ---                |

# Trouble-shooting chart

Customer complaint (symptom of trouble)

- | 1. Starting motor operates, but engine fails to start
- | 2. Rough idling
- | 3. Poor throttle response
- | 4. Engine lacks power
- | 5. Misfiring
- | 6. Fuel consumption too high
- | 7. Engine pings when accelerating
- | 8. Backfiring
- | 9. Engine becomes too hot

|   |   |   |   |   |  |  |  |  |                                                        |                                                                                                                                        |                    |
|---|---|---|---|---|--|--|--|--|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------|
|   |   |   |   |   |  |  |  |  | <u>Cause of trouble</u>                                | <u>Test instructions</u>                                                                                                               | <u>Coordinates</u> |
| • |   |   |   |   |  |  |  |  | Firing sequence incorrect                              | See Autodata test specifications.                                                                                                      | ---                |
| • | • | • | • | • |  |  |  |  | Ignition coil not O.K.                                 | Visual examination, electrical test                                                                                                    | B 7                |
| • |   |   |   |   |  |  |  |  | Trigger box not O.K.                                   | Check peak-coil-current cut-off                                                                                                        | B 16               |
|   |   |   |   | • |  |  |  |  | Trigger box not O.K.                                   | Check primary voltage                                                                                                                  | B 16               |
| • |   |   |   |   |  |  |  |  | Short circuit on primary side                          | Check voltage supply of trigger box and/or primary circuit                                                                             | C 1                |
| • |   |   |   |   |  |  |  |  | Ignition-distributor magnetic pulse generator not O.K. | Magnetic pulse generator voltage and control leads.<br>Magnetic pulse generator voltage supply.<br>Magnetic pulse generator operation. | C 3<br>C 5<br>C 7  |

**B5**

Trouble-shooting chart

Seat



**B6**

Trouble-shooting chart

Seat



## 10.5 Start of trouble-shooting program

Starting motor operates, but engine fails to start or engine misfires or lacks power.

yes

Continued on B 8

**B7**

Trouble-shooting program

Seat



yes

Check primary signal.

If oscilloscope or tachometer tester not available, check for ignition spark on spark discharge tester.

Primary signal with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions. Start engine. Oscilloscope must indicate primary voltage (magnitude not important).

Primary signal with tachometer tester

Connect tachometer tester to ignition coil as per operating instructions. Start engine. Tachometer tester must register a value (magnitude not important).

Ignition spark with spark discharge tester

Remove high tension ignition cable at terminal 4 of ignition coil.  
Connect spark discharge tester with sleeve-type suppressor (5 k $\Omega$ ) to ignition coil.  
Set spark gap to 5 mm.  
Start engine.  
Sparks must appear across spark gap.

Are primary signal and/or ignition sparks in spark gap present?

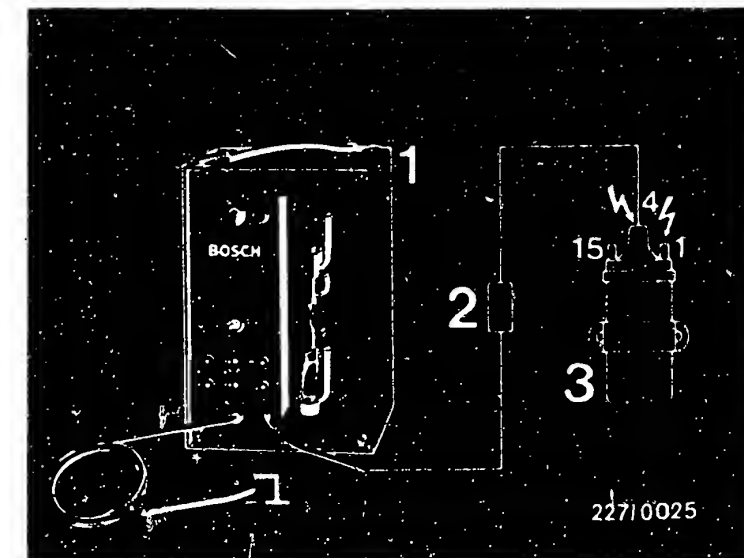
yes

Continued on B10/B11

no

If no primary signal or ignition spark is present, continue test at coordinate C 1.

Test beginning at B 10 not necessary.



- 1 = Spark discharge tester
- 2 = 5 k $\Omega$  sleeve-type suppressor
- 3 = Ignition coil

Danger arrows:  
(400 V - 25 kV)

**B8**

Trouble-shooting program

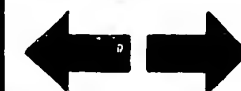
Seat



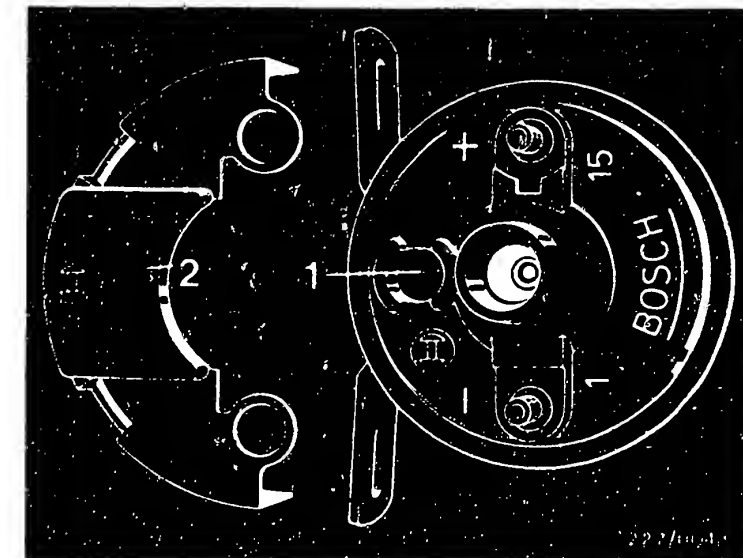
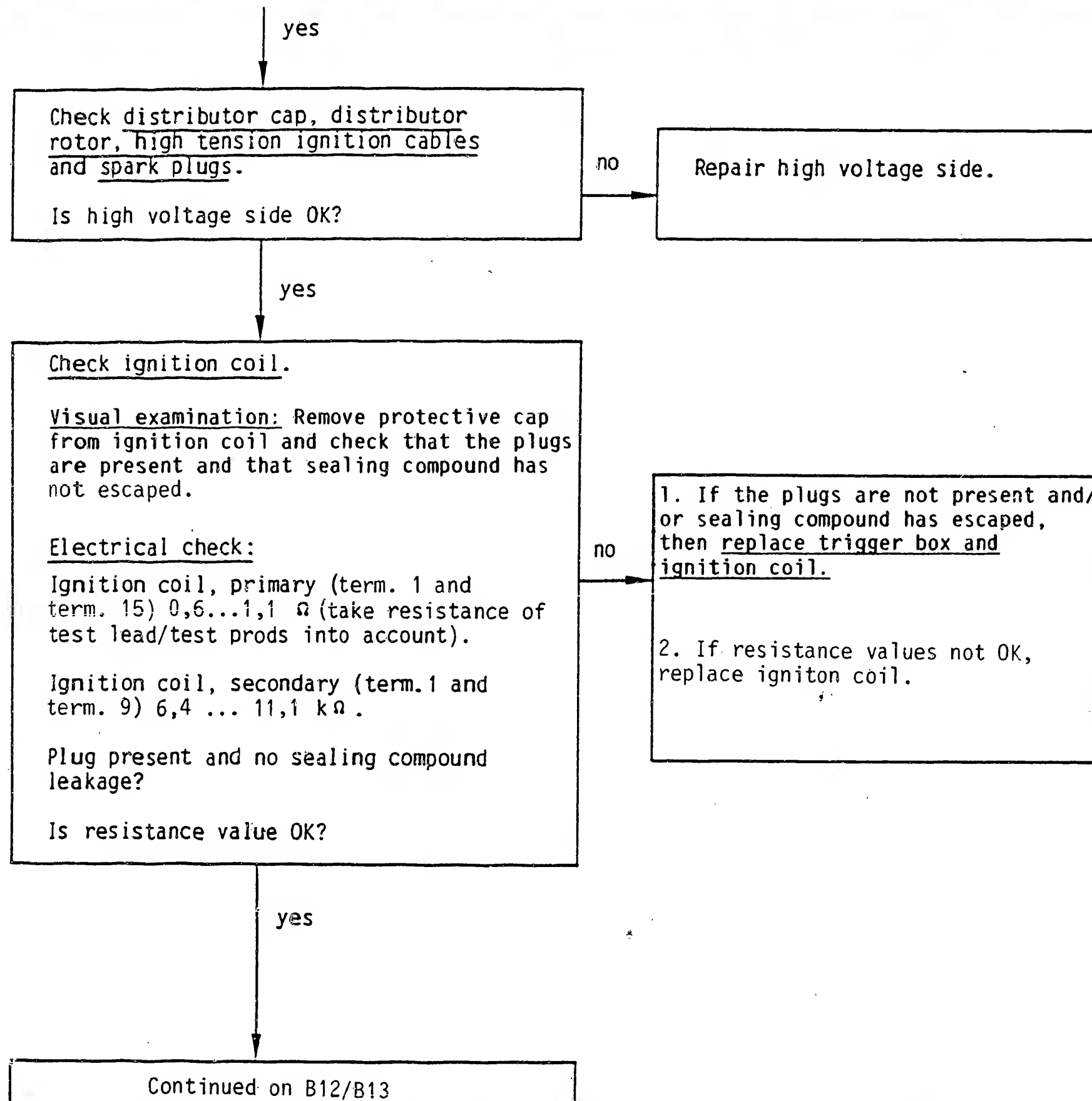
**B9**

Trouble-shooting program

Seat







1 = Plugs  
2 = Protective cap

**B10**

Trouble-shooting program

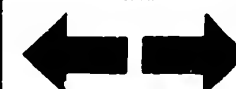
Seat

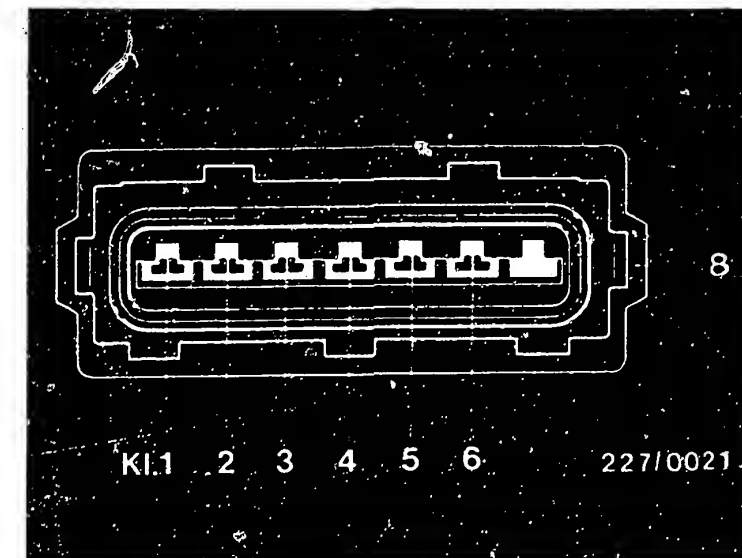
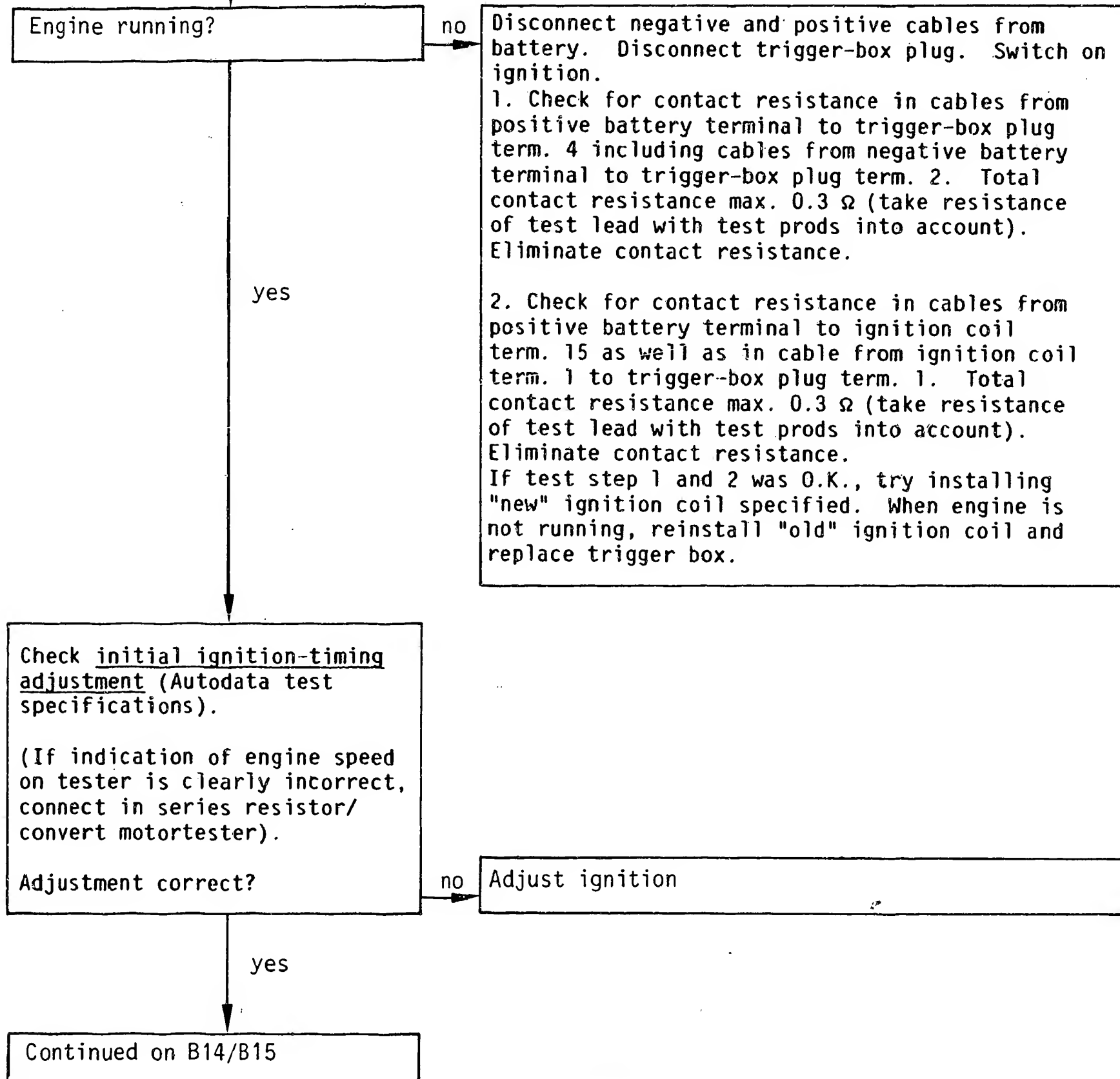


**B11**

Trouble-shooting program

Seat





1 = Trigger-box plug

**B12**

Trouble-shooting program

Seat

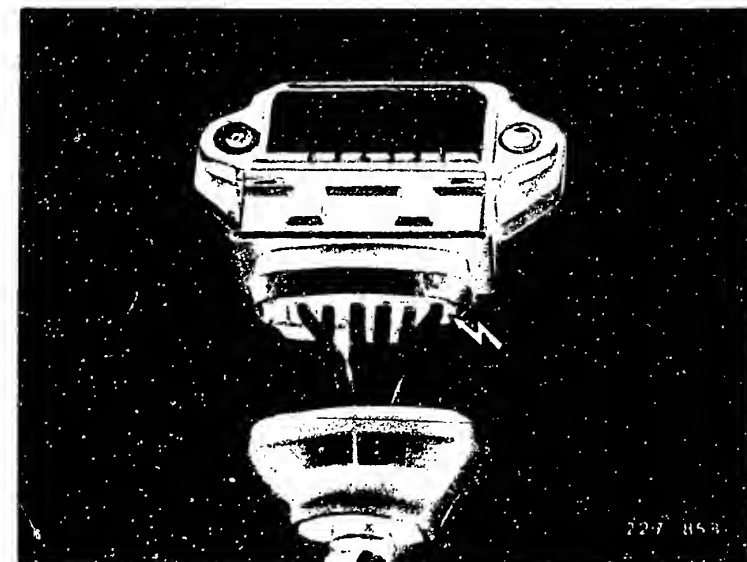
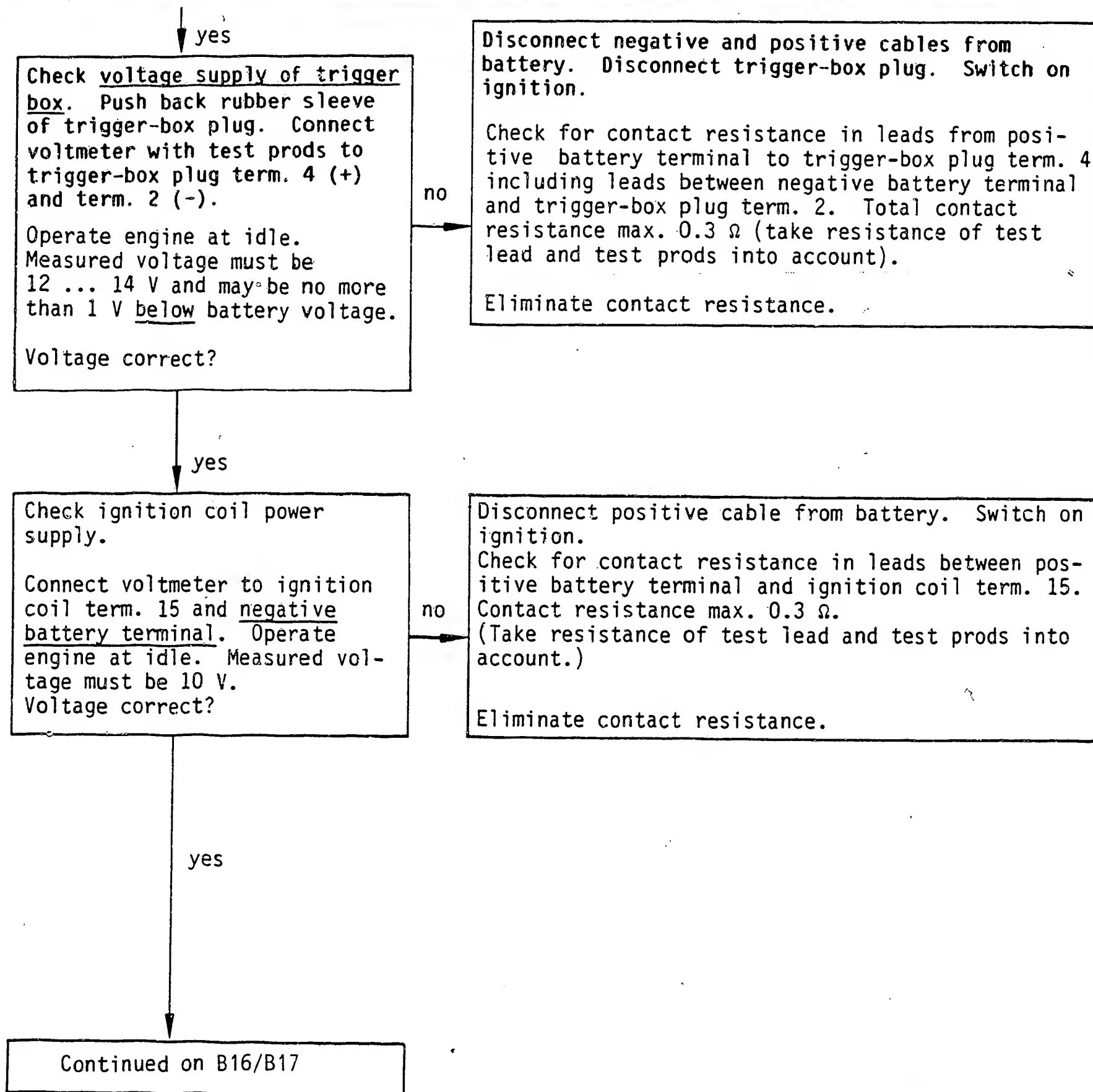


**B13**

Trouble-shooting program

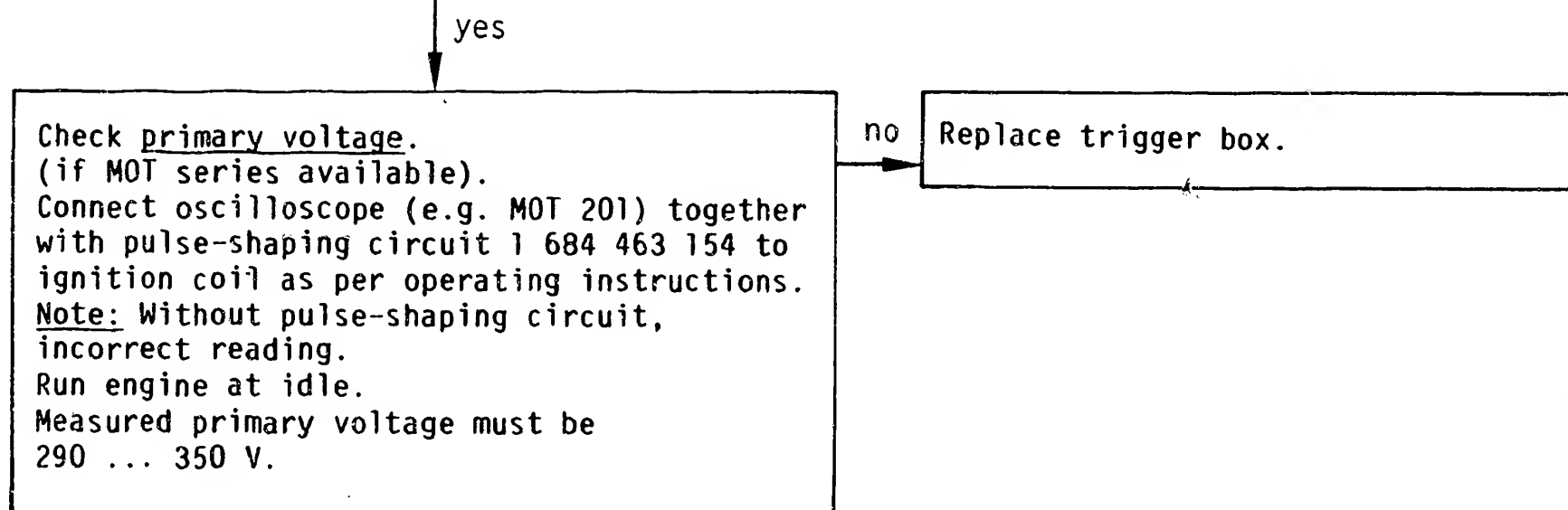
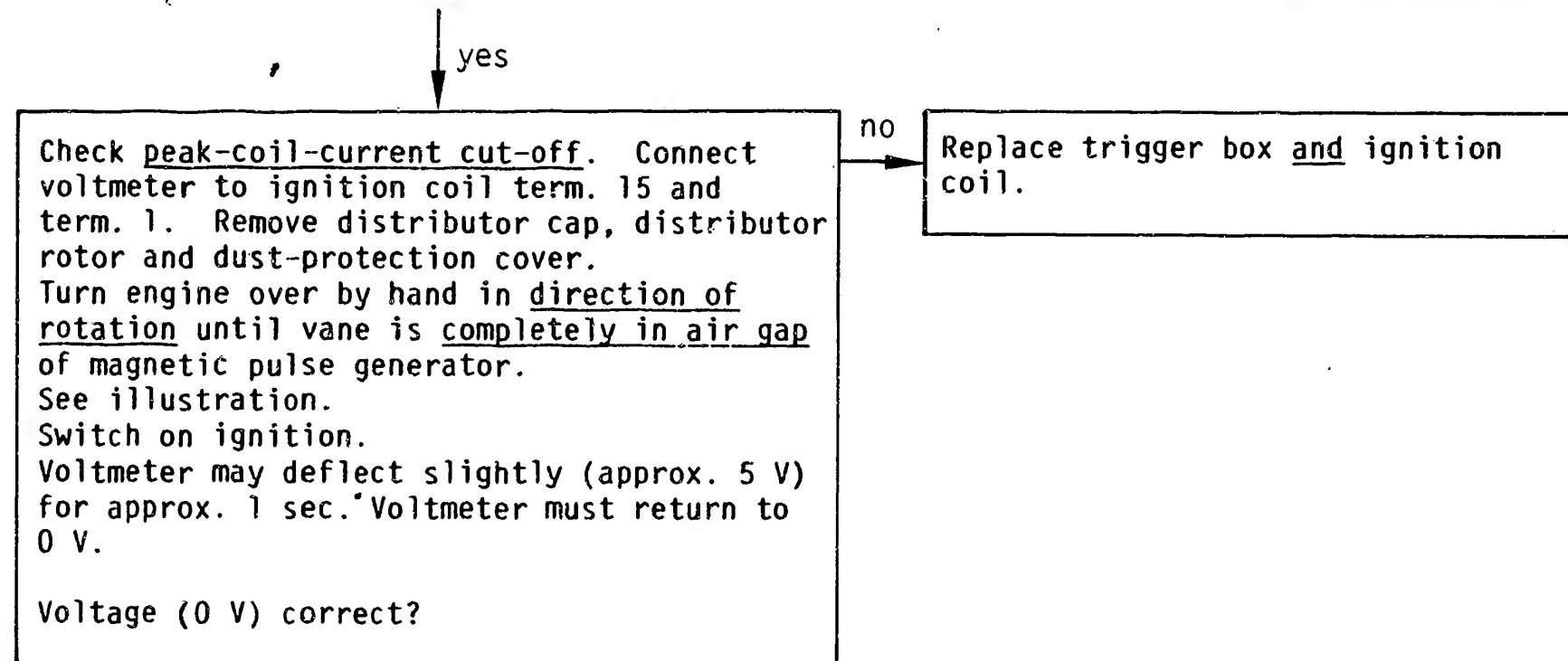
Seat





Trigger box with connector





Continued on B 18

yes

Continued

If all test steps O.K. and customer complaint is not yet remedied, try installing "new" ignition coil specified.

If customer complaint is not yet remedied, reinstall "old" ignition coil.

Ignition system O.K.

Tests starting at C 1 are now no longer necessary.

Note: If customer complaint is not yet remedied, check for further fault possibilities in the fuel system. Check if engine mechanically O.K.



No primary signal or no ignition spark  
(continued on B8/B9)

yes

Check voltage from control unit.  
Disconnect trigger-box plug and connect voltmeter to term. 4 (+) and term. 2 (-). Switch on ignition. Voltmeter must indicate battery voltage. Is voltage value OK?

no

Check leads and connections between ignition/starter switch and control unit connector terminal 4 and ground lead terminal 2 for discontinuity. Eliminate discontinuity.

yes

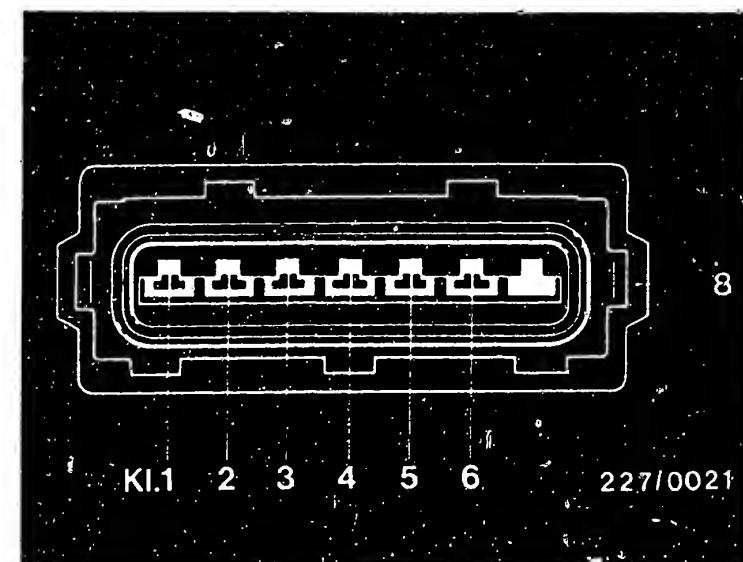
Check primary circuit.  
Connect positive lead of voltmeter to terminal 1 and negative lead to terminal 2 of unplugged control unit connector. Switch on ignition. Voltmeter must indicate battery voltage. Is voltage value OK?

no

Check lead from ignition/starter switch to ignition coil terminal 15, the primary winding of the ignition coil, and the lead from ignition coil terminal 1 to control unit connector terminal 1 and ground lead terminal 2 for continuity. Eliminate discontinuity.

yes

Continued on C3/C4



1 = Trigger box plug

**C1**

Trouble-shooting program  
Seat



**C2**

Trouble-shooting program  
Seat



yes

Check voltage and control leads of magnetic pulse generator.

Disconnect ignition-distributor plug, connect voltmeter with test prods in turn to:

| <u>Ignition-distributor plug</u> |     | <u>Trigger-box plug</u> |
|----------------------------------|-----|-------------------------|
| Term. 5                          | and | term. 5                 |
| Term. 3                          | and | term. 3                 |
| Term. 6                          | and | term. 6                 |

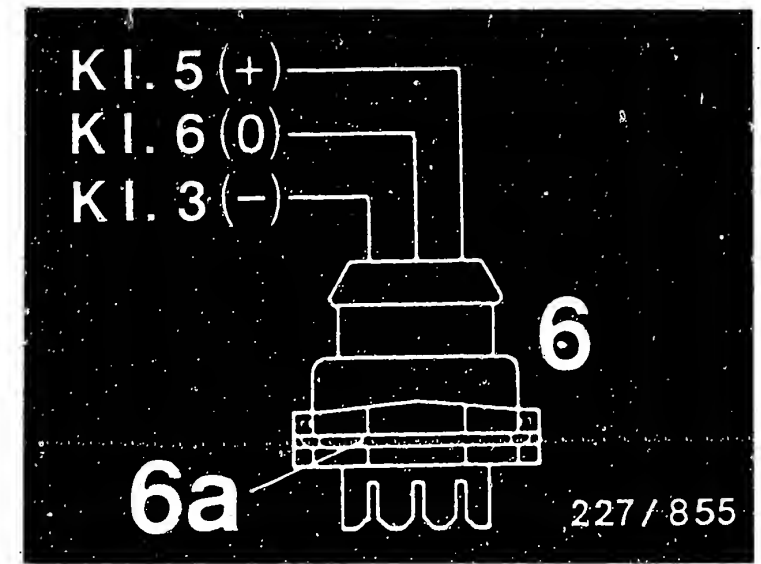
Ohmmeter must indicate continuity each time.

Continuity present?

no  
Eliminate short circuit.

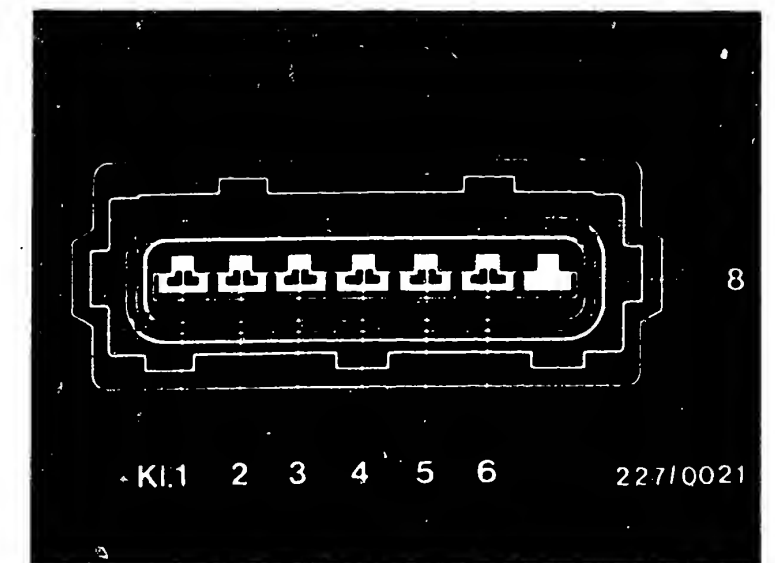
yes

Continued on C5/C6



6 = Ignition-distributor plug  
6a = Wire-strap fuse

1 = Trigger-box plug



yes

Check voltage supply of magnetic pulse generator.

Connect trigger-box and ignition-distributor plugs.

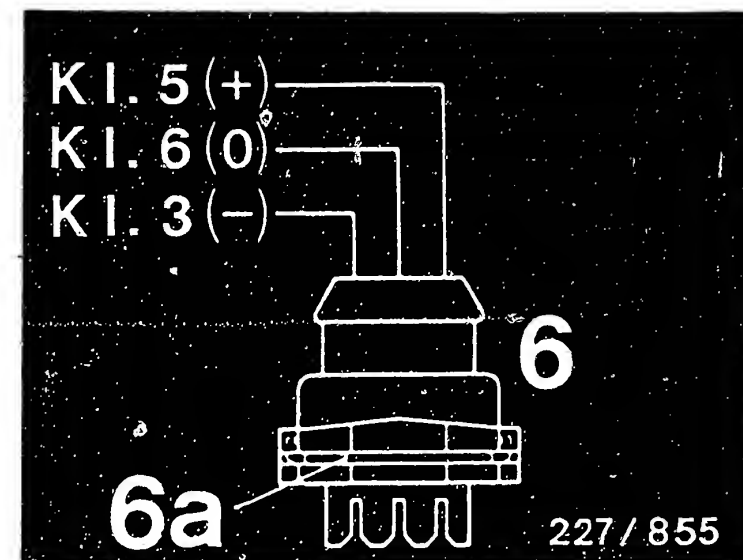
Push back rubber sleeve of ignition-distributor plug.  
Connect voltmeter with test prods to term. 5 (+) and term. 3 (-).  
Switch on ignition.  
Measured voltage must be at least 10 V.

Voltage correct?

no Replace trigger box.

yes

Continued on C7/C8



6 = Ignition-distributor plug  
6a = Wire-strap fuse

**C5**

Trouble-shooting program

Seat



**C6**

Trouble-shooting program

Seat





yes

Check operation of magnetic pulse generator.

Trigger-box plug and ignition-distributor plug connected.

Push back rubber sleeve of ignition-distributor plug.

Connect oscilloscope in program-selector-switch position "Special" as per operating instructions.

For example MOT 201:

Red terminal with test prod to ignition-distributor plug term. 6 (measuring signal). See upper illustration.

Black terminal to ground.

Start engine.

The oscilloscope must indicate a rectangular pulse. See lower illustration.

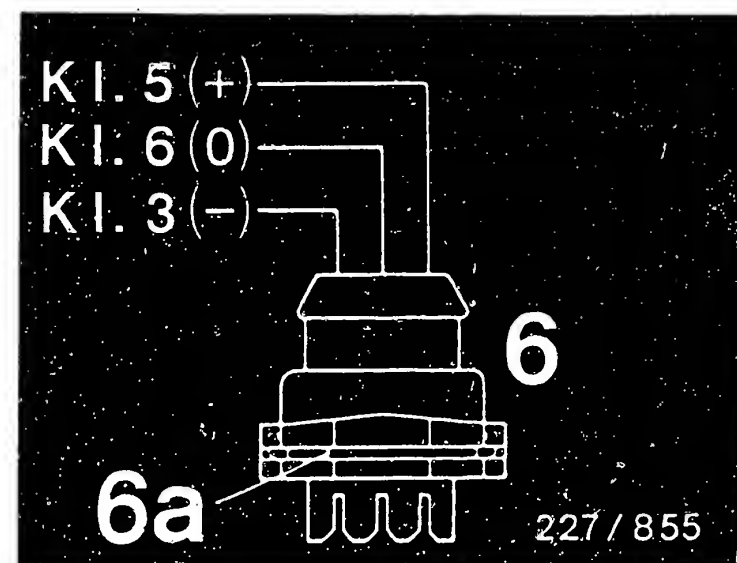
Rectangular pulse available?

no

Replace magnetic pulse generator or ignition distributor.

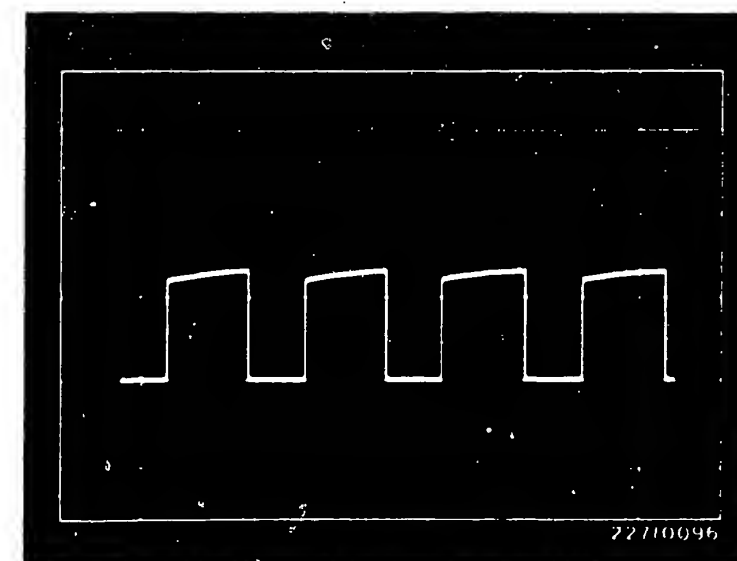
yes

Continued on C9/C10



6 = Ignition-distributor plug  
6a = Wire-strap fuse

Rectangular pulse



C7

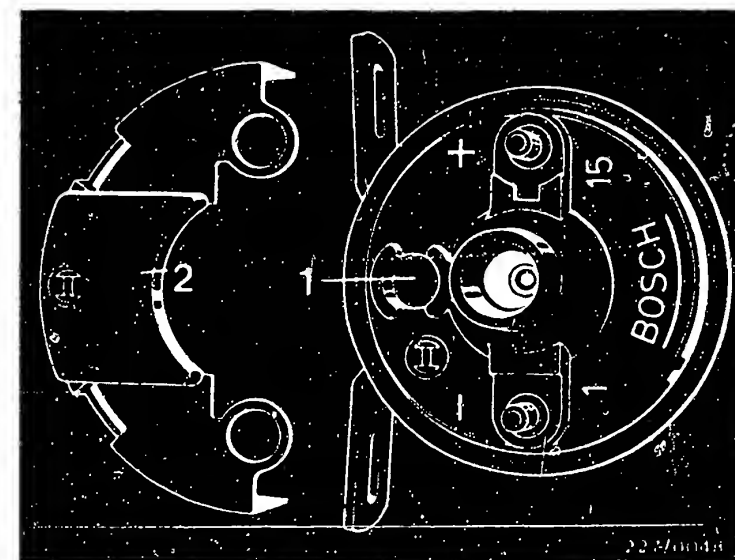
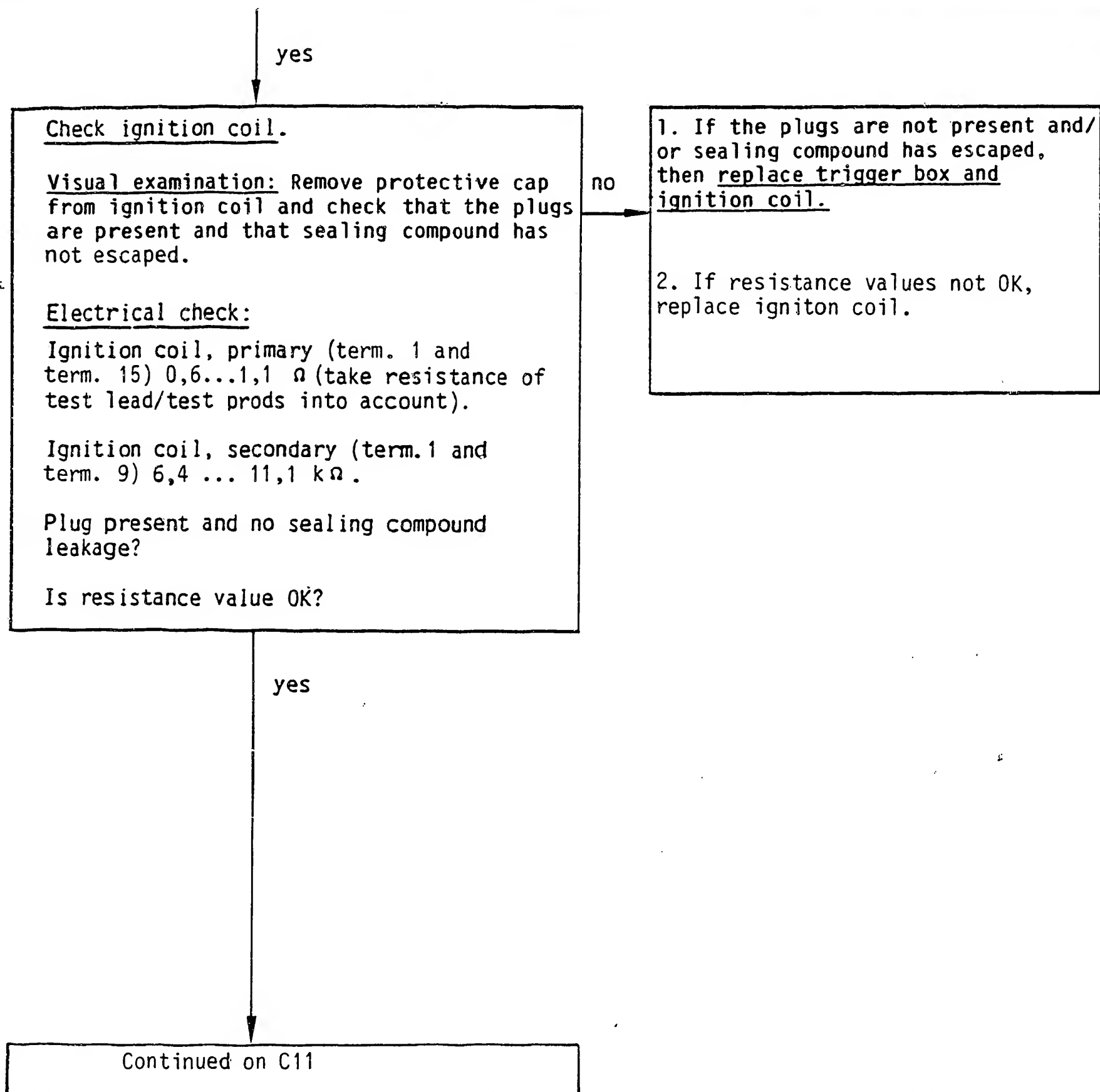
Trouble-shooting program  
Seat



C8

Trouble-shooting program  
Seat





1 = Plug  
2 = Protective cap

yes

Continued

If all test steps O.K. and there is still no primary signal or ignition spark available, try installing "new" ignition coil specified.

If primary signal or ignition spark are still not available, reinstall "old" ignition coil and replace trigger box.

Test completed

Tests from B 7 not necessary.

Note: If customer complaint is still not remedied, then look for further possible faults in the fuel system, or the engine is not mechanically O.K.



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party

**22**

### Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-toch tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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**N1**

Technical Bulletin

Seat

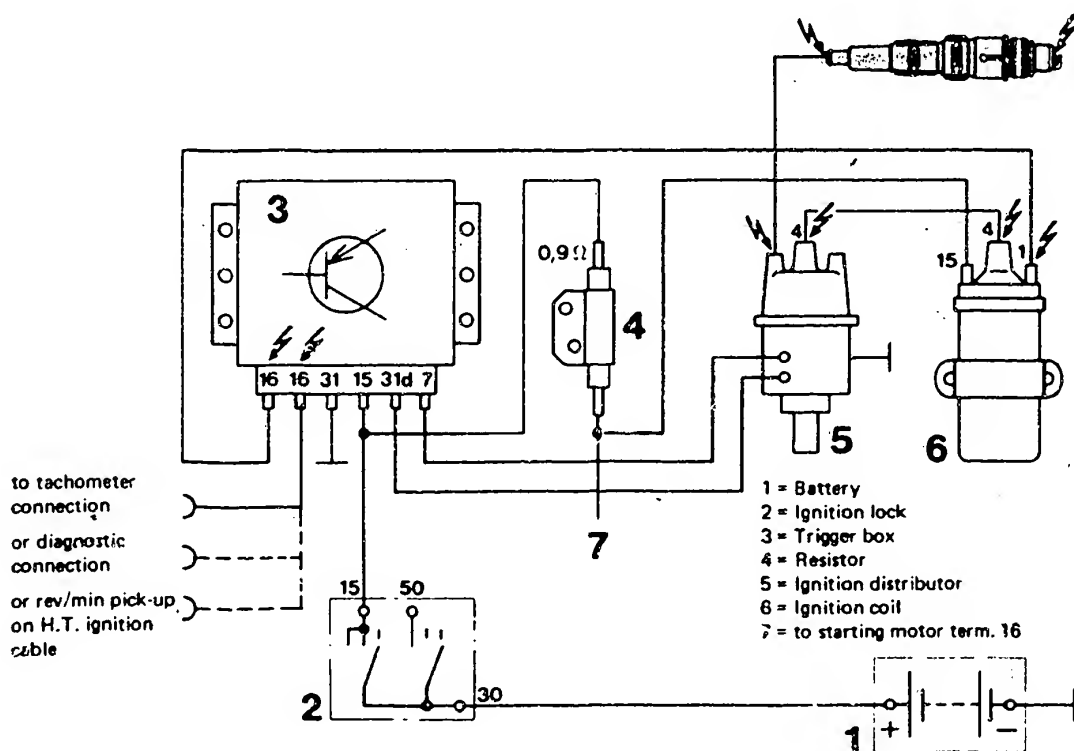


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram



# After-sales Service

## Technical Bulletin

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EFFECTS OF ELECTRICAL AND ELECTRONIC  
SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En

1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).  
Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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**N3**

Technical Bulletin

Seat



We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.



# After-sales Service

## Technical Bulletin

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### BREAKERLESS TRANSISTORIZED IGNITION SYSTEM

22

#### Warranty note

VDT-f-227/103 En

Hybrid construction trigger boxes

3.1979

0 227 100 100 for ignition distributor  
with Hall generator (TCI-h)  
0 227 100 102 for ignition distributor  
with induction-type  
pulse generator (TCI-i)

Apart from the well-known TCI trigger boxes 0 227 100 0.., trigger boxes of hybrid construction have been fitted as standard since 9.78 (Fig. 1).

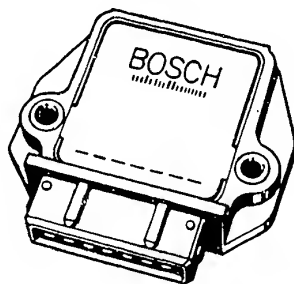


Fig. 1

#### Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH  
KH/LAV - Auspackraum

zur Weiterleitung an K1/VAK 21

D-7000 Stuttgart 30

This instruction remains valid until further notice.

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**N5**

Technical Bulletin

Seat





# After-sales Service

## Technical Bulletin

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NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En

1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

| Designation                                      | Abbrev'd code  | Meaning                          | Switching                   | Ignition control and spark advance | High-voltage distribution         |
|--------------------------------------------------|----------------|----------------------------------|-----------------------------|------------------------------------|-----------------------------------|
| Coil ignition                                    | SZ (CI)        | -----                            | Mechanical (breaker points) | Mechanical (ignition distributor)  | Mechanical (ignition distributor) |
| Transistorized coil ignition                     | TSZ-K (TCI-c)  | K=breaker-triggered              | Electronic (trigger box)    | Mechanical (ignition distributor)  | Mechanical (ignition distributor) |
| Trigger box with conventional circuit techniques | TSZ-I* (TCI-i) | I=Induction-type pulse generator | Electronic (trigger box)    | Mechanical (ignition distributor)  | Mechanical (ignition distributor) |
|                                                  | TSZ-H          | H=Hall generator                 | Electronic (trigger box)    | Mechanical (ignition distributor)  | Mechanical (ignition distributor) |
| Transistorized ignition                          | TZ-I* (TI-i)   | I=Induction-type pulse generator | Electronic (trigger box)    | Mechanical (ignition distributor)  | Mechanical (ignition distributor) |
| (Trigger box in Hybrid technique)                | TZ-H* (TI-h)   | H=Hall generator                 | Electronic (trigger box)    | Mechanical (ignition distributor)  | Mechanical (ignition distributor) |

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**N6**

Technical Bulletin

Seat



| Designation                                                      | Abbrev'd code | Meaning              | Switching                                | Ignition control and spark advance | High-voltage distribution                                                     |
|------------------------------------------------------------------|---------------|----------------------|------------------------------------------|------------------------------------|-------------------------------------------------------------------------------|
| Breakerless semiconductor ignition with or without knock control | EZ<br>EZ-K    | -<br>K=Knock control | Electronic (trigger box or control unit) | Electronic (control unit)          | Mechanical (ignition distributor or high-voltage distributor)                 |
| Distributorless ignition with or without knock control           | VZ<br>VZ-K    | -<br>K=Knock control | Electronic (control unit)                | Electronic (control unit)          | Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug) |

\*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

**N7**

Vehicle Service Information

Seat



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

INCORRECT DISPLAY OF ROTATIONAL SPEED AND  
DWELL ANGLE ONLY WITH TRIGGER BOXES  
0 227 100 ... (TCI-i, TCI-h) WITH CURRENT  
LIMITATION

VDT-I-Gen. 030 En  
6.80  
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

|              |                         |            |
|--------------|-------------------------|------------|
| MOT 001.00 } | Rotational-speed        | KTE 001.00 |
| 001.01 }     | display O.K. with these | 001.02     |
| 001.02       | testers                 | 001.03     |
| 001.04       |                         |            |
| 002.00       |                         |            |

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

|                    |                                       |                                                                        |                                      |
|--------------------|---------------------------------------|------------------------------------------------------------------------|--------------------------------------|
| Audi               | (Bosch/Fairchild-<br>ignition system) | Mazda                                                                  | (Mitsubishi ignition<br>system)      |
| BMW                | (Bosch ignition system)               | Mitsubishi                                                             | (Mitsubishi ignition<br>system)      |
| Citroen            | (Delco ignition system)               | Nissan-Datsun                                                          | (Hitachi ignition system)            |
| Fiat               | (Delco ignition system)               | Peugeot                                                                | (Bosch ignition system)              |
| Ford               | (Delco ignition system)               | VW                                                                     | (Bosch/Fairchild ignition<br>system) |
| General-<br>Motors | (HEI-ignition system)                 | Bosch transistorized ignition system<br>for retrofitting 0 227 100 920 |                                      |

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**N8**

Vehicle Service Information

Seat



## 2. Test instructions

### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min<sup>-1</sup> to 1200 min<sup>-1</sup>).

It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

### Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm

Part No. 0 227 900 002

or

1 ballast resistor 1.0 Ohm

Part No. 0 227 900 101

2 blade receptacles e.g.

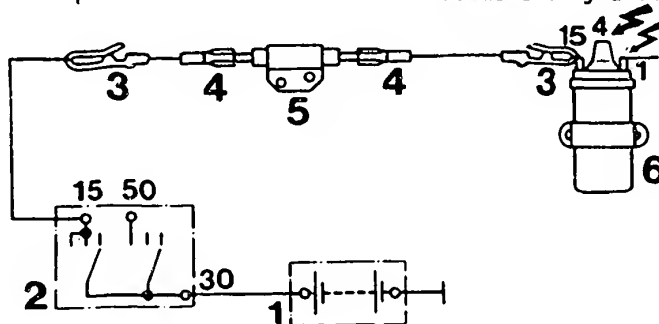
Part No. 1 901 355 881

approx. 0.2 m cable, 1.5 mm<sup>2</sup> e.g.

Part No. 6 210 150 150

2 insulated clips

Commercially available



1 = Battery

4 = Blade receptacle

⚡ approx. 400 V

2 = Ignition switch

5 = Ballast resistor

25 kV

3 = Clips

6 = Ignition coil

### 2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

### 2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

### MOTORTESTER CONVERSION

Incorrect display of rotational speed,  
dwell angle and ignition point  
only with trigger boxes  
0 227 100 ... (TCI-i, TCI-h) with current  
limitation

VDT-I-Gen. 032 En  
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268  
268 S 10  
269  
214 B  
AE 2000

### 1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

### 2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

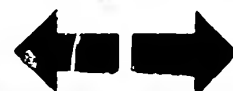
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**N10**

Vehicle Service Information

Seat





#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "standard"

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

TESTS ON ELECTRONIC IGNITION SYSTEMS  
(TCI, TZ)  
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En  
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- "Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

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**N13**

Vehicle Service Information  
Seat





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